



An Overview of the Parametric Cost Estimating Initiative

Definition:

What is Parametric Cost Estimating?

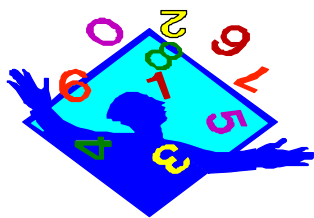
- Cost estimating methodology using analytical techniques and historical costs and other program variables such as system physical characteristics or performance characteristics, etc.
-
- Estimating technique employing one or more cost estimating relationships for the forecasting of costs associated with development, manufacture, and / or modification of an end item - based on the product's technical, physical, or other characteristics.





Examples of Product Characteristics

Product	Physical or Performance Characteristics
Building Construction	Floor Space, Roof Surface Area, Wall Surface
Passenger Car	Weight, Wheel Base, Passenger Space, Horsepower
Turbine Engine	Dry Weight, Maximum Thrust, Cruise Thrust, Specific Fuel Consumption, Inlet Temperature
Reciprocating Engine	Dry Weight, Piston Displacement, Compression Ratio, Horsepower
	Empty Weight, Speed, Useful Load, Wing Area, Power, Landing Speed





Parametric Applications



❖ **Industry**

- Bid / No Bid Analysis
- Conceptual Estimating
- Design To Cost (or “CAIV”)
- Independent Cost Estimates
- Life-Cycle Cost Estimates
- Risk Analysis
- ***Proposal Preparation***
 - ◆ Where (certified or other than) cost or pricing data would be submitted to the government.



Parametrics & Acquisition Reform

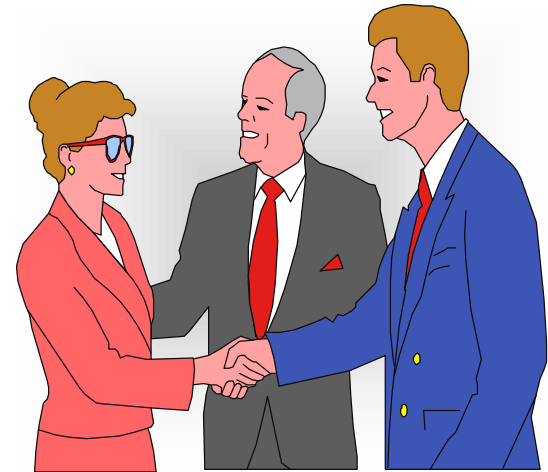
- ❖ TINA Requirements
 - Cost or pricing data must be certified as current, accurate, and complete
- ❖ Purpose of TINA
 - Provide all the facts available at the time of certification
- ❖ Properly Calibrated / Validated Parametric Cost Techniques Meet the Requirements of TINA
- ❖ Coopers and Lybrand / TASC Study “The DoD Regulatory Cost Premium - a Quantitative Assessment”
 - TINA is the number two cost driver
- ❖ DoD Regulatory Cost Premium Working Group Study
 - Identified parametrics lab as a key acquisition reform initiative



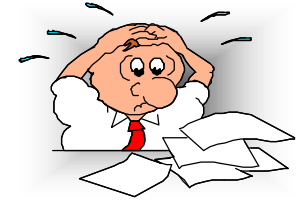
Why Implement Parametric Techniques As A Primary Basis Of Estimate?

❖ **Anticipated Benefits**

- Improved Customer Satisfaction Through:
 - ◆ More reliable estimates
 - Increased use of historical costs
 - ◆ Reduced proposal preparation costs
 - Potential 25-95% Reduction
 - ◆ Reduced proposal preparation cycle time
 - Potential 25-95% Reduction



Initiative Overview



❖ **Parametric Practitioners Met in Early 1994**

- Evaluate why there is not greater use of parametric cost estimating in DoD and NASA business proposals
 - ◆ Limited use of complex parametric cost models to prepare proposals submitted to the government for contracts
 - Most proposals are based on very detailed, voluminous data
 - Sometimes this detailed data is based on unsupported engineering estimates (e.g., judgmental estimates)
- Identify barriers to the expanded use of parametric cost estimating techniques
- Identify actions needed to eliminate barriers and take advantage of parametric opportunities



Initial Barriers Identified

Barriers Identified

- Lack of DoD/NASA policy statement supporting parametrics as a valid estimating technique
- High implementation costs
- Regulatory concerns
- Cultural issues
 - ◆ Lack of understanding
 - ◆ Customer acceptance
 - ◆ Resistance to change
- Lack of training
- Lack of case studies on successful use of complex parametrics



Evaluation of Initial Barriers

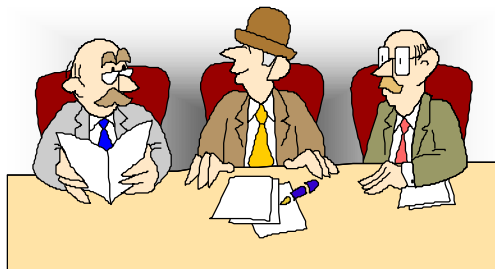
❖ **Conclusions**

- No real barriers identified that would preclude expansion of parametric cost estimating techniques
- However, there were barriers to overcome
- Identified a need for industry experts to demonstrate that parametric techniques are as reliable as other estimating techniques

ACTION!

Established the Parametric Estimating Initiative

ACTION!



Accomplishments to Date



- **Formed PCEI Executive Steering Committee and Working Group to Oversee Key Action Items**
 - Participants from industry, all military services, NASA, DCMC, and DCAA
- **Provided Briefings to Acquisition Executives and the Workforce**
- **Obtained Industry and Government Senior Management Support and Encouragement**
- ❖ Recommended Regulatory Enhancements to Encourage Use of Parametrics
 - FAR 15 Rewrite includes references to parametrics
- ❖ Established the Reinvention Laboratory

Executive Support

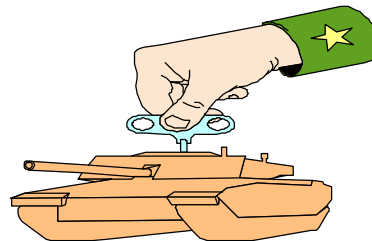


- ❖ Top Level Industry, DoD, and NASA Executives Endorse the Use of Properly Calibrated/Validated Parametric Cost Estimating Techniques
- ❖ “We need to **encourage** the use of **parametric cost estimating throughout our organizations**. **More opportunities** for using parametrics **need to be explored**. By ensuring that we have properly calibrated and validated parametric models, we greatly increase the likelihood that estimating systems will be based on credible, auditable data used in a consistent manner to provide results.”

Ms. Eleanor Spector, Director of Defense Procurement
PCEI Workshop - October 1996

Future Plans of the PCEI

- ❖ Reinvention Lab Sites Complete Tests
 - 3rd Quarter CY 1998
- ❖ Prepare and Distribute Case Studies
 - Fall of 1998
- ❖ Update and Distribute the 2nd Edition of the Handbook
 - Fall of 1998
- ❖ Support Development of the DAU Training Course
 - Spring of 1999



Case Studies



- ❖ PCEI Working Group Is Assisting Lab Teams in Completing The Case Studies
- ❖ Case Studies Will Include
 - Detailed description of models tested/implemented
 - Data collection and normalization best practices
 - Calibration and validation best practices
 - Estimating system policies and procedures
 - Regulatory and cultural challenges
 - Customer acceptance
- ❖ Case Studies Will Be Included in the 2nd Edition of the Parametric Cost Estimating Handbook
- ❖ Case Studies Will Also Be Used to Develop the Formal Training Course





Handbook Background



❖ **Prepared and Distributed 1st Edition of the Parametric Cost Estimating Handbook in September, 1995**

- Served as the primary source of guidance for identifying, developing, calibrating, validating, and evaluating parametric cost estimating techniques
- Available on the DoD Acquisition Deskbook under discretionary documents

❖ **Feedback Received from Users**

- Significant changes needed
 - ◆ New regulations (FASA / FARA)
- Need calibration and validation examples
 - ◆ Examples will be based on the documented results of the lab teams

2nd Edition of the Handbook



❖ **The Parametric Cost Estimating Handbook Is Currently Being Updated to Include**

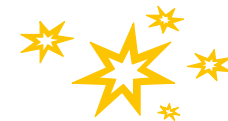
- More examples of parametric techniques, particularly calibration and validation
- New chapters on
 - ◆ Company developed models
 - ◆ Regulatory issues
 - ◆ Technical evaluations
 - ◆ Price / cost analysis evaluations
 - ◆ Other parametric cost estimating applications, such as
 - Price analysis of subcontractor quotes
 - Reviewing data other than cost or pricing data
 - Cost as an independent variable (CAIV)
 - ◆ Frequently asked questions



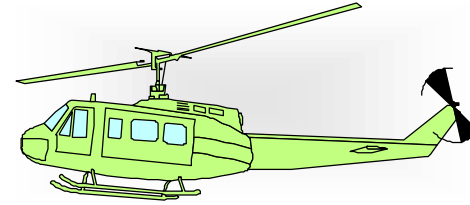
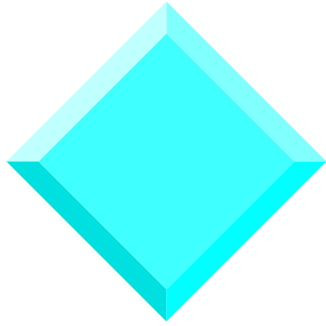
Reinvention Laboratory Participants

Pilot Sites

- ★ Boeing Aircraft & Missile Systems (Mesa, AZ)
- ★ Boeing Aircraft & Missile Systems (St. Louis, MO)
- ★ Boeing Information, Space, and Defense Systems Group (Seattle, WA)
- ★ Boeing Reusable Launch Vehicle Systems (Downey, CA)
- ★ GE Aircraft Engines (Cincinnati, OH)
- ★ Lockheed Martin Astronautics (Denver, CO)
- ★ Lockheed Martin Electronics & Missiles (Orlando, FL)
- ★ Lockheed Martin Tactical Aircraft Systems (Ft. Worth, TX)
- ★ Motorola Space & System Technology Group (Scottsdale, AZ)
- ★ Northrop Grumman ESSD (Baltimore, MD)
- ★ Northrop Grumman ESID (Rolling Meadows, IL)
- ★ Raytheon ECI Division (St. Petersburg, FL)
- ★ Raytheon HRB Systems (State College, PA)



TEAMWORK



Case Study:
Boeing Aircraft & Missiles Systems
Mesa, AZ
CER Implementation



Boeing - Mesa IPT Initial Objective

- ❖ Develop Validated Parametric Techniques for Estimating That Are Acceptable to Contractor, DCMC, DCAA and the Customer for the Purpose of Negotiating Contractual Actions
- ❖ Identify Parametric Opportunities That Could Be Utilized As Test Parametric Cases
- ❖ Define Industry / Government Involvement and Roles
- ❖ Barrier Identification and Resolution
- ❖ Develop a Formal Process for Implementing Parametric Techniques



Boeing - Mesa IPT Roles & Responsibilities



- ❖ **Early-On, The IPT Established Roles & Responsibilities**
 - **DCAA/DCMC/AMCOM** - Real time constructive review, feedback and recommendations, statistical analysis, monitoring of metrics
 - **DCMC/AMCOM** - Memorandum of Agreement (MOA)
 - **BA&MS** - Model development, and statistical analysis, model maintenance and MOA, develop and maintain metrics



Boeing - Mesa IPT Selection Process

- ❖ Brainstorming Session, October 1995 - Identified 13 Candidates for CERs
- ❖ Joint Team Selection
 - Tool Material \$ (Non-Recurring)
 - Technical Manuals / Publications
 - REVIC (Software Model)
- ❖ Other Process Applications
 - MOA on 200+ CERs ***Success achieved through the application of parametrics training information)***

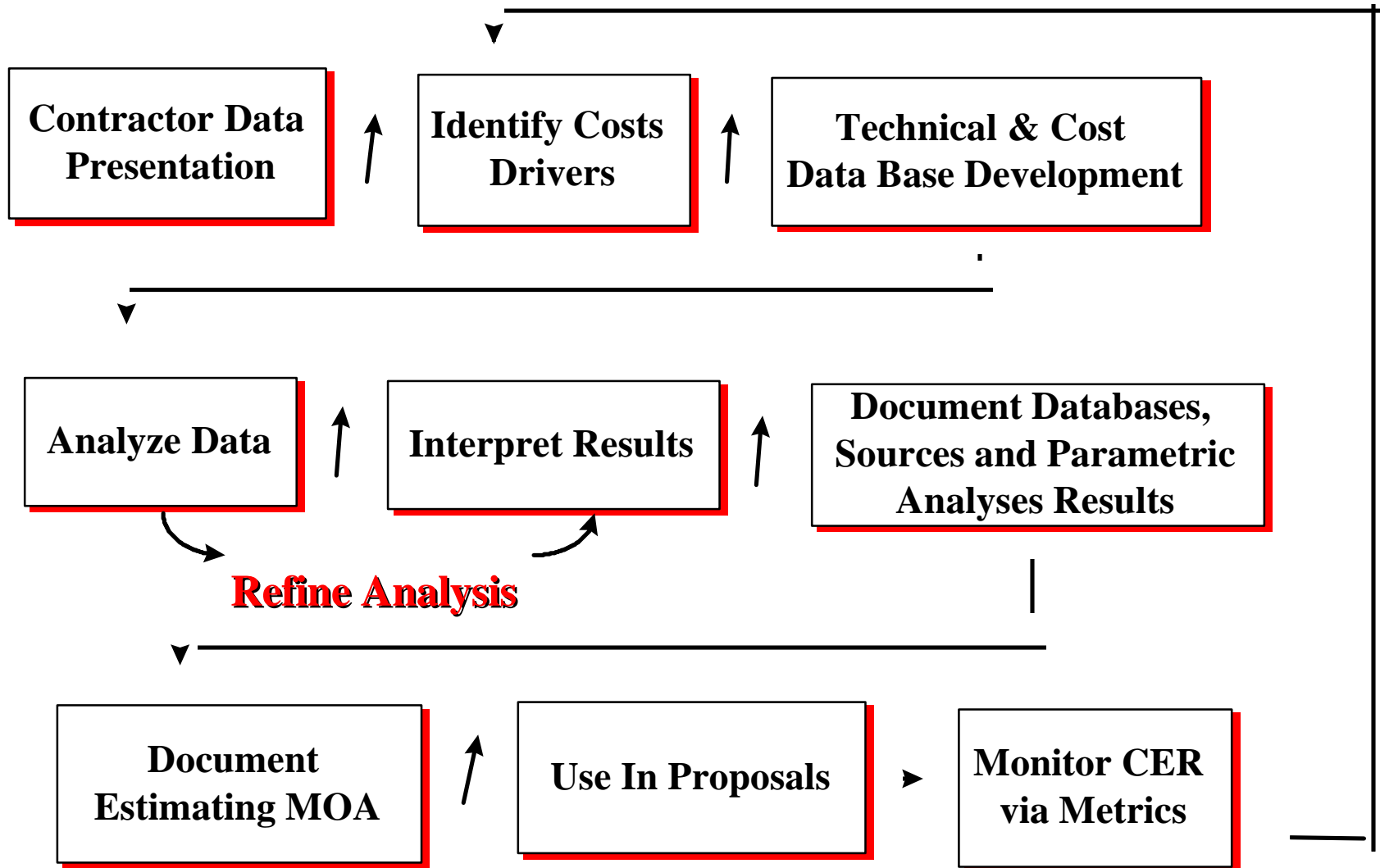


Boeing - Mesa IPT Parametrics Approach

- ❖ The Team followed the guidelines as noted in the 1st Edition of the Parametrics Handbook
 - (1) Establish the Source Data
 - (2) Perform Statistical Analysis
 - (3) Validate the Data and Models
 - (4) Document the Models
 - (5) Develop a Process for Model Maintenance
 - Periodic Updates
 - Metrics



Boeing - Mesa IPT Process Flow Chart



Boeing - Mesa IPT

Summary of Major Barriers/Solutions

❖ Barriers

- (1) Interpretation of Statistical Analysis
- (2) Availability of Data
- (3) Team Opposing Differences and Biases



❖ Solutions

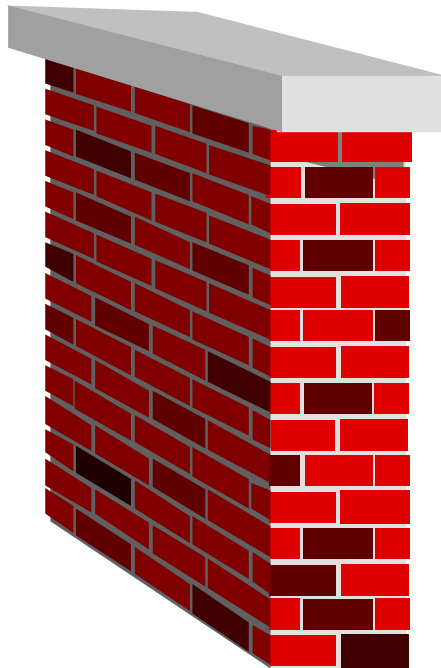
- (1) Joint Parametrics Training
- (2) Technical Survey - 3rd party assessment of independent variables; research analysis of data
- (3) ***Constant feedback loop: Government and Industry team willingness to share and discuss methods and approaches***

Boeing - Mesa IPT Where The Team Was.....

Contractor
Collected Data



Information was
Passed Over the Wall



Contractor
Analyzed Data

DCAA Analyzed &
Audited Data



DCAA Issued Report

BA&MS Reviewed
& Argued with Findings

DCMC Developed
Position

Factors Used
in Pricing

Each Contract
Negotiated Separately

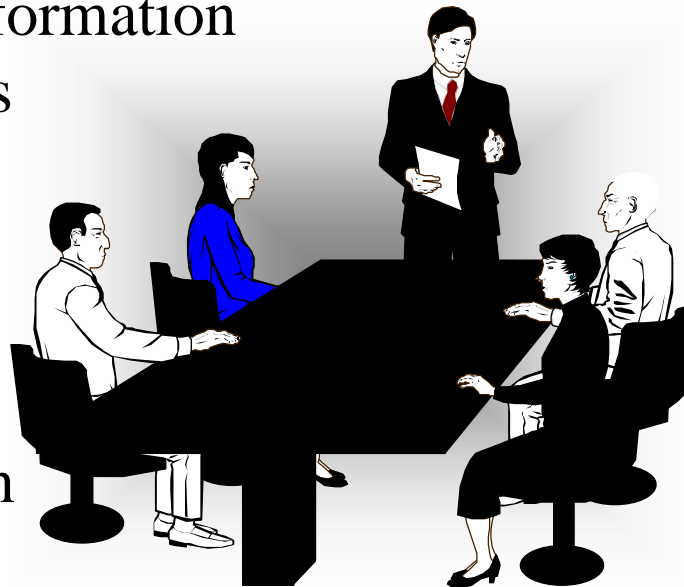


Boeing - Mesa IPT

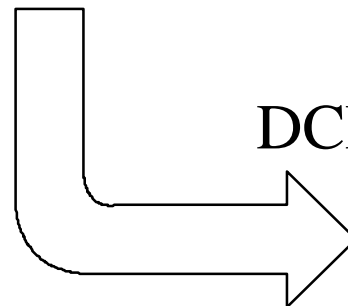
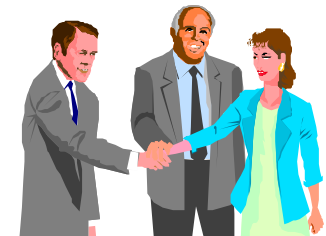
Where The Team Is Now.....

Contractor Provides
Data, Program Information
and Data Analysis

DCMC Provides
Analysis and
Determines Position
from a Contracts
Perspective



DCAA Provides
Independent Audit,
Analysis & Guidance
Through Formal and
Informal Reports,
Memos and Discussions



DCMC/AMCOM/Boeing
Memorandum of
Agreement

Boeing - Mesa IPT

What Does the Customer Expect?

- ❖ Consistent Estimating Across Programs & Services
- ❖ Simplified Pricing Proposals
- ❖ Smooth & Timely Negotiations
- ❖ Reduced Acquisition Time
- ❖ Reduced Acquisition Costs



Boeing - IPT

How Was Teaming Success Achieved?

- ❖ Recognize a Common Mission
- ❖ Share Common Training (or Experience)
- ❖ Establish Realistic Objectives
- ❖ Clarify Roles & Responsibilities
- ❖ Meet Regularly
- ❖ Exercise Mutual Cooperation & Respect



***Agreeing to Agree Yields a Win/Win
Situation***



Points of Contact

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- ❖ Terry Schneider HQ DCAA 703-767-3231
- ❖ Jim Gleason
 - ARMY MATERIEL COM 703-617-4437
- ❖ Art Nicholson AMCOM 205-313-4086
- ❖ Procurement Liason Auditor 810-574-8581
- ❖ William Roche
 - TACOM ACQUISITION CENTER 810-574-7203



PARAMETRIC COST ESTIMATING HANDBOOK

❖ <http://www.jsc.nasa.gov/bu2/PCEHHTML/pceh.htm>